# Performance Contracting: An Integrated Solution for Achieving Sustained Operational and Energy Efficiency

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While today's cities and counties face numerous challenges, few operations face tougher requirements or more demanding circumstances than water and wastewater utilities. Budget shortfalls, shrinking revenues, and staff reductions make it nearly impossible to address aging and inefficient infrastructure and escalating regulatory demands. In addition, there is mounting political and public pressure for utilities to become more sustainable.

In its 2012 report, "Buried No Longer: Confronting America's Water Infrastructure Challenge," the American Water Works Association highlights the need for many communities to significantly increase their levels of investment to address aging water and wastewater systems in order to sustain public health and safety and to meet the next generation of environmental standards. Also in 2012, the American Society of Civil Engineers (ASCE) reported that an investment of at least $12.8 billion is needed to improve Florida's drinking water infrastructure to ensure the safe delivery of water for the next 20 years. The U.S Environmental Protection Agency (EPA) purports that this amount should be $16.5 billion. The ASCE also reported that another $19.6 billion is required to improve Florida's wastewater systems for the same time period.

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Florida's utilities lack funding and face an enormous structural deficit—and the gap between these is quickly expanding. They are looking for partners with the necessary expertise, proven experience, and effective approach to help them address their challenges. The solution to the infrastructure challenge may be performance contracting.

But what exactly is performance contracting and how can it benefit utilities?

Originally developed in the 1980s as a project funding and delivery mechanism for building envelope systems, performance contracting is a turnkey solution that can help utilities leverage the benefits of process improvements and efficiency measures and make much-needed improvements to their water and wastewater facilities without the need for capital investment. Instead, utilities can reallocate utility and operating-expense savings to pay for targeted improvements (Figure 1).

Energy services companies (ESCO) are contractors that specialize in the development and delivery of programs that integrate design, scope development, construction, and performance verification services into a performance contract. Program improvements generate energy and operational savings (and in some cases can increase revenues), maximize energy efficiency, decrease life cycle costs, and improve the utility's ability to meet future mandates and operational demands. Best of all, these economic benefits are guaranteed by the ESCO and are used to fund the program's capital requirements. In the event of a savings or revenue shortfall, the ESCO is required to make restitution. As such, the performance risk is transferred from the utility to the ESCO.

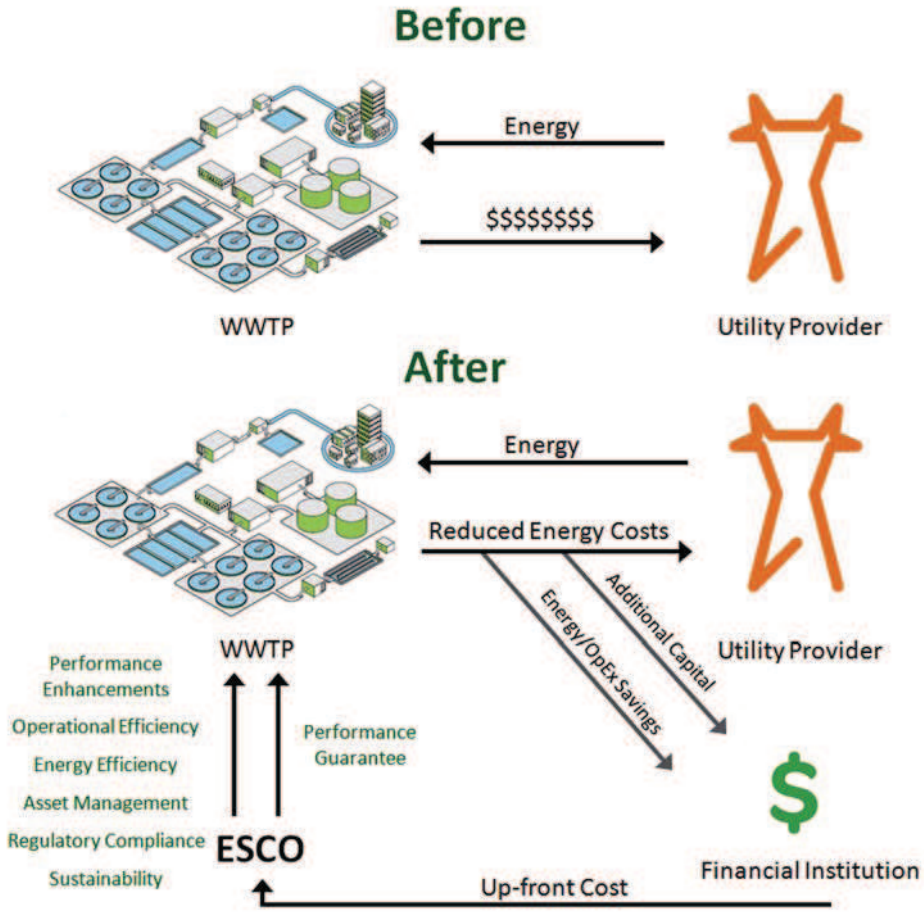


Figure 1. Paying for Targeted Improvements

## Traditional Procurement Versus Performance Contracting

For many years, municipal and public agencies have employed the design-bid-build (DBB) model to procure capital projects. The track record of DBB is extensive and filled with numerous drawbacks, proving it to be a cumbersome delivery system for complex projects and often leading to scope, cost, and schedule creep. As such, DBB is expensive, fraught with performance and operational efficiency challenges, and does not transfer risk from the owner in the way that performance contracting does.

In contrast, performance contracting allows for a design-build-at-risk offering with very prescriptive requirements and outcomes, minimizing the "gaming" of the process. Because contract execution is timely and delivered through a single source of responsibility with robust performance guarantees that are measured and verified annually, the general consensus is that performance contracting is up to 20 percent less expensive than traditional procurement methods.

Florida's municipalities and utilities have multiple options when procuring performance contracting solutions. Agencies can select an ESCO directly from the state term contract for energy savings, piggy-back off of an existing performance contract, or procure services via a request for qualifications (RFQ) or invitation to negotiate (ITN).

## Enabling Legislation

Numerous states have enacted performance contracting legislation. The Florida Legislature recently amended Florida Statute 489.145, "The Guaranteed Energy, Water, and Wastewater Performance Savings Contracting Act" in July 2013 and specifically included language to address water and wastewater projects.

### Highlights of the New Law

- The addition of the following water and wastewater efficiency measures:
  - "Meter replacement, installation, or modification; installation of an automated meter reading system; or other construction, modification, installation, or remodeling of water, electric, gas, fuel, communication, or other supplied utility system."[1]
  - "Any other energy conservation measure that reduces British thermal units (Btu), kilowatts (kW), or kilowatt hours (kWh); that reduces fuel or water consumption in the building or wastewater production; or that reduces operating costs or provides long-term cost reductions."[2]
  - "Any other repair, replacement, or upgrade of existing equipment that produces measurable savings, or any other construction, modification, installation, or remodeling that is approved by an agency and that is within the legislative authority granted the agency, such as an energy conservation measure."[3]
  - "Any other measure not otherwise defined that is designed to reduce utility consumption, reduce wastewater costs, enhance revenue, avoid capital costs, or achieve similar efficiency gains at an agency or other governmental unit."[4]
  - "Energy, water, or wastewater cost savings means a measured reduction in the cost of fuel, energy, or water consumption, or wastewater production, stipulated operation, and maintenance savings; improvements in supplied utility systems, including, without limitation, revenue enhancements or reduction in net operating costs resulting from increased meter accuracy or performance; and identified capital savings, created from the implementation of one or more energy, water, or wastewater efficiency or conservation measures when compared with an established baseline for the previous cost of fuel, energy, or water consumption, wastewater production, and stipulated operation and maintenance, meter accuracy or performance, and identified capital costs."[5]
- Savings are guaranteed. The ESCO is responsible for savings and/or revenue shortfalls.
- The payback and financing term must be less than 20 years.
- After project completion, savings are measured, verified, and reconciled annually (at a minimum).
- Performance contracts can be funded via several financial vehicles, including tax-exempt lease purchases, bonds, revenue pledges, cash, revolving loan funds, or other measures. The ESCO may also secure rebates, grants, and incentives to improve the financial payback. However, savings and/or revenues must be sufficient to pay for all improvement measures that will be implemented via the performance contract.


Figure 2. Comprehensive Integrated Strategy

## One Size Does Not Fit All

While performance contracting is an excellent tool for utilities to use, selecting the right ESCO partner is critical.

Traditional performance contracting applications in the water sector as delivered by an ESCO concentrated solely on energy efficiency and include infrastructure replacements, like pumps, motors, and blowers. This rudimentary approach often falls short as very little attention is focused on why the utility attained an inefficient operational status. Over time, utilities and plants have undergone myriad changes and expansions,

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often delivered by the design engineer using applicable state design thresholds and favoring peak-flow estimates. These changes can result in the cascading effect of conservative design, selection of oversized equipment, and incorporation of inefficiencies and operational challenges. While traditional ESCO solutions are easily implemented and have quick paybacks, they often prove themselves to be little more than short-term fixes that can adversely impact the long-term operations of the facility.

Water and wastewater utilities are complex in nature. When performance contracting is incorporated into a comprehensive integrated strategy, it enables the utility to extract the maximum output for the least capital investment (Figure 2). Performance guarantees can be leveraged by municipal governments and utilities, which can develop a single or hybrid funding strategy that serves the best interests of the owner with the least impact to an enterprise fund and ratepayers—a true win-win proposition.

This integrated approach addresses six key elements: operational efficiency, performance enhancement, energy efficiency, procurement efficiency, regulatory compliance, and sustainability and public image. These elements are applied to the entirety of the utility operations or treatment processes and solutions are developed that complement each facet of utility operations, as opposed to a singular upgrade or enhancement. The aggregated impact of this approach generally results in the development of solutions that facilitate savings and enhance performance.

## Opportunities in Water and Wastewater Infrastructure

The municipal utility is generally comprised of water and wastewater treatment, delivery, and collection systems. In water utilities, most of the energy is consumed by pumping; except for an application like a desalination membrane treatment system, much less energy is used in the treatment process. In wastewater treatment, biological reactors are very energy intensive and constitute 40 to 60 percent of the annual spending at the facility, followed by collection system pumping. With energy costs escalating annually, municipal owners are focusing on driving efficiency and implementing solutions that result in favorable outcomes.

Water treatment varies across Florida, ranging from more rudimentary groundwater extraction, disinfection, and delivery systems, to more exotic surface water treatment processes, such as desalination through membrane technologies. The latter system type requires more energy, and the design engineer must include energy recovery devices to offset the increased energy demand. In traditional water treatment, gravity is used for plant flow and pumping is sporadic and intermittent (i.e., backwashing of filters). Performance enhancement solutions are limited and mainly involve improved automation and controls that allow the plant to be managed in a real-time mode.

On the water delivery side, energy is expended in pumping that is required to fill elevated storage tanks, ground storage tanks, and reservoirs, or for keeping the system properly pressurized to comply with applicable delivery metrics. High-service pumping stations are key energy efficiency targets for solutions. In the absence of dynamic pump station optimization protocols, decision making is relegated to operators and basic controls. This informal protocol precludes the use of optimum operational efficiency based on demand and system pressures, sequencing of pumps, pump operations within the preferred operating ranges (or "sweet spot"), and leveraging the maximum use of variable frequency drives. The end results of employing a dynamic pump optimization program within the station allows for extended pump life and elimination of transients, thereby limiting pipe bursts due to water hammer, tracking pump health on a real-time basis, and saving energy by minimizing specific energy consumption.

Another key area of concern to most municipal owners is the percentage of nonrevenue water (NRW). Nonrevenue water is defined by AWWA as the "sum of unbilled authorized consumption (water for firefighting, flushing, etc.), apparent losses (customer meter inaccuracies, unauthorized consumption, and systematic data handling errors) and real losses (system leakage and storage tank overflows)."[6] More simply put, NRW is water that has been distributed but is not reflected in any customer billings.

Driving efficiency through the employment of advanced metering infrastructure (AMI), automated meter reading (AMR) solutions, and appropriate meters for all flow conditions and applications, coupled with leak detection, results in timely revenue enhancements and real and apparent water loss correction.

Wastewater treatment plants are designed to treat unique influent flow characteristics and comply with permitted discharge standards. Generally, wastewater treatment facilities employ activated-sludge-extended aeration processes for the liquid stream and can utilize sophisticated aerobic or anaerobic digestion processes to manage solids. In between, plants utilize screening, grit removal, disinfection, nutrient removal (if required), sludge thickening, solids dewatering, and open-cell lysis technologies. In addition to the mechanical processes, wastewater plants also utilize certain chemicals and polymers to enhance plant operations and performance.

Of late, larger plants with anaerobic digesters have recognized the value of capturing and enhancing methane gas production to power cogeneration units. Achieving energy neutrality is gaining momentum, and most municipal owners are evaluating or im-

Table 1. Wastewater Plant Performance Strategies

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| Performance Enhancements | Implement unique process enhancements that drive efficient, effective asset utilization. | 20%-50% energy savings |
| Operational Efficiency | Apply the right automation and control technologies to optimize plant performance. | 5%-10% energy savings |
| Energy Efficiency | Evaluate status of major power-consuming equipment and execute improvements with guarantees on performance. | 5%-7% energy savings |
| Sustainability and Public Image | Assess, plan, implement, and report sustainable metrics to move toward self-reliance and net-zero energy consumption. | |
| Regulatory Compliance | Develop key strategies for current and future regulations. | |
| Procurement Efficiency | The right products, solutions, and partners that deliver projects faster than traditional methods. | Up to 20% less expensive; faster implementation |
| NET Zero Cogeneration | Implement unique process enhancements that result in enhanced methane gas generation in the anaerobic digestion process. | 25%-100% increase in methane generation |

plementing strategies to offset energy costs by generating power from within the plant.

Wastewater pumping stations, commonly referred to as lift stations, are usually operated by rudimentary controls and operator discretion. Dynamic pump station optimization solutions will result in favorable economic outcomes in specific energy savings and life cycle extension of the operating systems.

Comprehensive integrated strategies and solutions dictate a complete and thorough understanding of the treatment technologies, and their collective impact from one process to another, as the wastewater flows through the plant. Detailed process knowledge and understanding allows a focused, forensic assessment of plant operations and leads to customized solutions that offer the opportunity to extract the maximum output from the process and the plant as a whole.

Typical solutions and expected results in wastewater plants are summarized in Table 1.

## A Parting Thought

Well-maintained water and wastewater infrastructure is critical to a utility's ability to properly and efficiently manage water use, water quality, and water resources. The active maintenance of infrastructure requires significant capital investment, and Florida faces a sizable structural deficit where capital needs outpace available funding. Without action, declining infrastructure will impact the state's water and wastewater systems that serve 19.3 million people. However, utilities do have options, and a performance contracting program that is integrated into a comprehensive strategy may very well be the answer for which they are looking.

## References


- [1,2,3,4,5] Florida Statutes, Section 489.145, Guaranteed Energy, Water, and Wastewater Performance Savings Contracting Act, July 2013.
- [6] American Water Works Association, *Water Loss Control: Water Loss Control Terms Defined*, 2012.